Gillies, D.G. and D.J. Green. 1980

An interim report on food and growth of walleyes, Stizostedion vitreum vitreum (Mitchill), from four rearing ponds bordering on Lake Winnipegosis, Manitoba, in 1978 and 1979.

MANITOBA
DEPARTMENT OF NATURAL RESOURCES
Fisheries Branch

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ABSTRACT

In 1978 and 1979, walleye fry stocked in four rearing ponds located in close proximity to Lake Winnipegosis were sampled at regular intervals from June through October to document their feeding habits and growth.

Walleyes in Coleman, Freshwater, Kelly and Pacheta ponds were opportunistic feeders and ate what was seasonally available and abundant. Cladocerans and copepods were important food items of the larval walleyes within two weeks of hatching. Although amphipods were abundant in all ponds, the degree to which they were consumed by walleyes varied between ponds. Coleman Pond walleyes relied heavily on chironomid larvae and amphipods throughout the season. *Chaoborus* larvae were almost exclusively eaten in Kelly Pond. Fish (brook sticklebacks and fathead minnows)

were eaten in all ponds, but were not available to the same degree in each pond. Overwinter survival of forage fishes appeared to vary from pond to pond. Freshwater Pond walleyes utilized forage fishes heavily in 1978 and 1979.

Walleye growth varied between rearing ponds and from year to year. Growth was rapid from hatching to mid or late July (60 - 75 days of age) and then tapered off in August (100 - 120 daysof age). Early rapid growth was also indicated by length increments between sampling periods. Between-sampling period length increments from 15 to 75 days of age were 10% or more of the total summer's growth. After 75 days, increments were less than 10% of the total summer's growth. After 100 days of age when the walleyes varied from 74 to 116 mm in fork length, they were allowed to escape from the rearing ponds.

Walleyes from Kelly Pond exhibited the best average growth in 1979, while Freshwater Pond walleyes had the best growth in 1978. Slowest growth in both years was observed in Pacheta Pond walleyes. Growth rates were similar in 1978 and 1979 in Coleman and Pacheta ponds. Walleyes in ponds with lower stocking rates generally exhibited better growth.

Although differences in growth were apparent, an analysis of covariance ($P \geq 0.05$) conducted on the slopes of the age-length regressions indicated no significant differences

between the 1978 and 1979 growth of walleyes in each pond. However, comparisons between ponds in the same year indicated some significant differences. A significant difference was found when the fastest walleye growth in 1978 (Freshwater Pond) was compared to the slowest (Pacheta Pond). No difference was found between the fastest and slowest growth in 1979.

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INTRODUCTION

Several fish rearing ponds were developed in the early 1970's in the Sagemace Bay - Duck Bay areas of Lake Winnipegosis (Fig. 1). The purpose of these rearing ponds is to raise walleye fry *(Stizostedion vitreum vitreum)* to fingerling size under optimum conditions; i.e. in the absence of predators and in the presence of an assured and abundant supply of natural food. The fingerlings are then released into Lake Winnipegosis during the late summer to enhance the dwindling natural walleye populations in the lake and consequently commercial walleye catches.

Some of the Lake Winnipegosis rearing ponds were intensively studied for three years in an effort to determine their impact on the walleye fishery. In 1977, the federal Department of Fisheries and Oceans (Freshwater Institute), with financial support from the Manitoba Government, studied Freshwater and Coleman ponds (Fig. 1). In 1978, the Freshwater Institute and the Manitoba Fisheries Branch jointly examined the above ponds as well as three additional ponds; Pacheta, Chartrand and Kelly ponds (Fig. 1). Only Fisheries Branch personnel were involved in the rearing pond assessment in 1979.

This report presents data on food and growth of walleyes in the rearing ponds through the 1978 - 1979 seasons. Comparisons

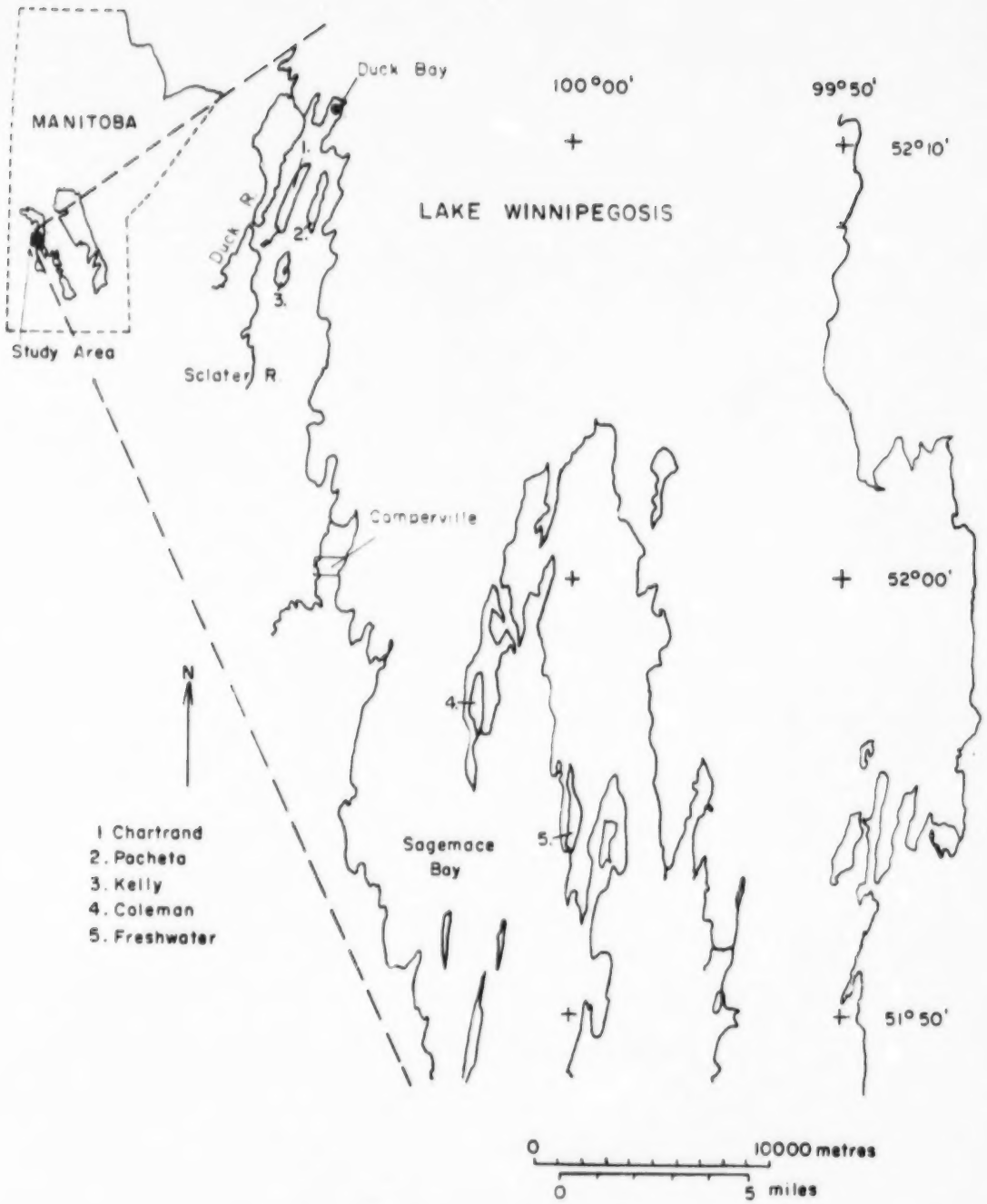

Fig. 1. Locations of walleye rearing ponds in the Sagemace Bay - Duck Bay areas of Lake Winnipegosis.

will be made with results from the 1977 work on Freshwater and Coleman ponds. A brief literature review is also included which considers some comparable studies conducted in other areas. Green (1980) described the stocking of the rearing ponds and the first-summer survival and autumn releases of walleyes from the rearing ponds in 1978 and 1979. A brief description of the physical and chemical characteristics of Coleman and Freshwater ponds are presented by Campbell and Rowes (1980).

METHODS

Dates and numbers of walleyes stocked in Coleman and Freshwater ponds were as described by Green (1980). Stocking dates of four day old fry in Kelly and Pacheta ponds were May 19 and June 2 in 1978 and 1979, respectively. Number of walleyes stocked in Kelly and Pacheta is described by Green (1980) .

In 1978, walleyes were sampled from all rearing ponds weekly from May through October. The walleyes sampled were from Freshwater, Coleman, Pacheta, Chartrand and Kelly ponds.

In 1979, walleyes stocked in Freshwater and Coleman ponds were sampled bi-weekly. Problems were encountered at Freshwater Pond in 1979 when young pike *(Esox lucius)* gained access to the pond, presumably through a damaged control gate on the release culvert. Freshwater Pond was sampled regularly until mid-August, until walleye numbers declined to a point where an adequate sample could no longer be obtained.

Walleyes in Pacheta and Kelly ponds were sampled on a monthly basis in 1979. Chartrand Pond was not sampled in that year. Although the pond had been stocked with walleye fry, a dyke on the pond's outlet channel had been breached early in the summer allowing predatory and other fish species to invade the pond.

Three methods were used to capture walleye samples; metre net, beach seine and a Beamish trapnet. The metre net was successfully used in all ponds but Coleman to capture the first samples of walleye fry approximately one to two weeks after stocking. The metre net was towed for five minutes each time and at a speed of approximately 8 km hr^{-1}. Best success was achieved when the net was towed over a dark bottom and just brushing the bottom mat

of vegetation.

Sampling with a metre net on Kelly Pond posed a special problem. Large quantities of amphipods *(Gammarus* sp.*)* were taken in tows along with walleye fry. The amphipods mutilated the collected walleyes by eating the gut portion of the fry. Increased effort was therefore necessary to obtain the initial samples from Kelly Pond.

Walleye fry became increasingly difficult to catch with a metre net after they attained lengths of 14 - 19 mm. When fry were able to avoid the metre net, the lead from a Beamish trapnet was used as a beach seine. The lead is 15 m long and about 1.0 m in depth. When seining, one end of the lead was attached to shore and the net was brought around in an arc with the aid of a small power boat or a man in chest waders. Coleman and Freshwater ponds were better suited to seining than Pacheta, Kelly or Chartrand as the latter have very soft mud bottoms.

The balance of the sampling on the rearing ponds was done with a Beamish trapnet (Beamish 1972). The trapnet was checked after being set several hours. Until mid-July, the required sample could usually be obtained with a 4 hr set. Walleyes in Coleman and Pacheta ponds had attained a fork length of 50 mm by this time. Walleyes in Kelly Pond had a mean fork length of 104 mm by mid-July. After mid-July the trapnets had to be set for 24 hr to obtain an adequate sample. Analysis of walleye feeding habits was adversely affected with samples from overnight sets. Large numbers of individuals with empty

stomachs and stomachs containing unidentifiable digested matter appeared in the overnight samples.

Walleye samples were immediately killed and stored in 10% formalin. Whenever possible, each sample consisted of 50 walleyes in 1978 and 100 in 1979. All fish were sampled, at least for length and weight, within 12 hr of preservation. In measuring the fish, total lengths were recorded until the tail became forked, after which fork lengths were measured. In the laboratory the walleyes were blotted dry and weighed in bulk to the nearest 0.01 g with a Sartorius (Model 2550) top loading balance. A mean weight was determined. The stomach contents of 50 fish were identified and counted using a binocular microscope with an upper magnification limit of 40X. In 1979, the 50 walleye stomachs sampled were drawn at random from the sample of 100 walleyes.

RESULTS

Food

The 1978 and 1979 data on food of Lake Winnipegosis rearing pond walleyes were compiled in three ways. The first method considered the number and percentage of walleye stomachs containing a particular food item. Data are presented for Coleman, Freshwater, Kelly and Pacheta ponds. Comparisons

of these data with data collected by Campbell and Rowes (1980) from the Lake Winnipegosis rearing ponds in 1977 as well as comparisons with other studies were based on the percentage occurrence of walleye stomachs containing particular food items. The second method examined the numerical importance of individual food items by month for walleye samples from each of the four ponds. This method of presenting the data illustrates how many of one particular food item were consumed compared to other food types. It is, however, misleading where small numbers of fish ate large quantities of a specific diet item. The third method is a seasonal summary for each pond presenting the number and percentage occurrence of a food item based on all food items eaten in each year. This summary illustrates the overall importance of certain food organisms in the diet of the Lake Winnipegosis rearing pond walleyes. To avoid confusion, the data on walleye food habits are presented separately for each rearing pond.

Coleman Pond - Cladocerans were a major item in the early diet of Coleman Pond walleyes. From early to mid-June they were found in 89.5% and 82% of the walleye stomachs in 1978 and 1979, respectively (Tables 1 and 2). Copepods, second in importance, were observed in over 50% of the early to mid-June samples. In 1978, chironomids were of nearly equal importance in early and late June, but had become increasingly more important towards late June in 1979.

Table 1. The number (and percentage) of walleye stomachs containing a particular food item - Coleman Pond, 1978.

Food item		Sampling Period											
		Jun.		Jul.		Aug.		Sept.		Oct.		Nov.	
		1-13	20-27	3-9	17-23	1-15	27-28	3-10	16	1-12	23	1-8	Total
Trichoptera													
Odonata						1(0.7)		3(3.0)					4(0.4)
Coleoptera	Dytiscidae			2(2.0)									2(0.2)
Hemiptera	Corixidae			9(8.9)	9(8.4)	11(7.2)		1(1.0)		1(1.0)			31(2.9)
	Notonectidae												
Diptera	Unidentified		3(3.2)										3(0.3)
	Chaoborinae												
	Chironomidae	17(12.8)	13(13.8)	16(15.8)	22(20.6)	6(4.0)	4(4.1)	2(2.0)	1(2.0)		1(2.1)		82(7.6)
Plecoptera				1(1.0)									1(0.1)
Ephemeroptera													
Cladocera		119(89.5)	73(77.7)	36(35.6)	41(38.3)	28(18.4)	6(6.1)	5(5.0)					308(28.4)
Copepoda		68(51.1)	70(74.5)	80(79.2)	42(39.3)	23(15.1)	4(4.1)	3(3.0)					290(26.7)
Amphipoda		3(2.3)	1(1.1)	12(11.9)	11(10.3)	43(28.3)	34(34.7)	29(28.7)	11(22.0)	51(50.5)	30(62.5)	22(22.0)	247(22.8)
Hirudinea													
Fish			6(6.4)	4(4.0)	1(0.9)	8(5.3)	7(7.1)	3(3.0)	7(14.0)	1(1.0)	2(4.2)		39(35.9)
Insect remains				1(1.0)	1(0.9)	1(0.7)	1(1.0)					1(1.0)	4(0.4)
Plant matter						1(0.7)			1(2.0)		1(2.1)		3(0.3)
Digested matter			2(2.1)		17(15.9)	3(2.0)	9(9.2)	27(26.7)	6(12.0)	42(41.6)	2(4.2)	58(58.0)	166(15.3)
Empty stomachs		3(2.3)	3(3.2)	5(5.0)	32(29.9)	73(48.0)	45(45.9)	30(29.7)	27(54.0)	9(8.9)	15(31.3)	20(20.0)	262(24.2)
No. of stomachs		133	94	101	107	152	98	101	50	101	48	100	1085

Table 2. The number (and percentage) of walleye stomachs containing a particular food item - Coleman Pond, 1979. Each bi-weekly sample consists of 50 fish.

Food Item		Sampling Period										
		Jun.		Jul.		Aug.		Sept.		Oct.		
		15	29	14	28	10-11	25	9	22	7-8	19-22	Total
Trichoptera								6(12)				6(12)
Odonata						4(8)	2(4)	3(6)	3(6)	1(2)	1(2)	14(2.8)
Coleoptera	Dytiscidae				1(2)							1(0.2)
Hemiptera	Corixidae			3(6)	3(6)	4(8)	3(6)	1(2)	1(2)			15(3.0)
	Notonectidae											
Diptera	Unidentified											
	Chaoborinae											
	Chironomidae	1(2)	21(42)	24(48)	20(40)	5(10)	6(12)	3(6)		2(4)		82(16.4)
Plecoptera												
Ephemeroptera												
Cladocera		41(82)	24(48)	4(8)					1(2)	8(16)		78(15.6)
Copepoda		30(60)	24(48)	22(44)	2(4)		1(2)		1(2)	1(2)	1(2)	79(15.8)
Amphipoda				5(10)	5(10)	8(16)	8(16)	24(48)	6(12)	21(42)	2(4)	67(13.4)
Hirudinae												
Fish				1(2)		1(2)	6(12)	3(6)	2(4)	2(4)	9(18)	24(4.8)
Insect remains						1(2)						1(0.2)
Plant matter												
Digested matter				3(6)	6(12)	7(14)	4(8)		4(8)			24(4.8)
Empty stomachs			2(4)	2(4)	22(44)	24(48)	28(56)	26(52)	36(72)	21(42)	38(76)	199(39.8)
No. of stomachs		50	50	50	50	50	50	50	50	50	50	500

A greater variety of food organisms was observed in walleye stomachs during July, August and September. Cladocerans and copepods, however, still remained important foods during July in 1978. Although copepods and chironomids were common in the walleye diets in July, 1979, cladocerans had declined in importance. During July of 1978 and 1979, walleyes began selecting larger organisms such as dytiscids, hemipterans, amphipods and fish. Amphipods were selected by the majority of walleyes containing food from August to October in both years (Tables 1 and 2). In the fall (September - October) amphipods contributed extensively to the diet of the rearing pond walleyes. They were found in as many as 62.5% (1978) and 42% (1979) of the stomachs examined. Forage fish were eaten as early as June, 1978, but were usually consumed from late August to October in both years.

Overnight trapnet sets were made from the end of July onward. The number of empty stomachs occurring in these samples increased dramatically because of the length of time (20-24 hr) walleyes were held in the trap. In addition to the lack of opportunity for feeding by walleyes while trapped, the warm water temperatures probably increased their digestion rates.

Not only were cladocerans and copepods chosen by more walleyes during June and July (Tables 1 and 2), but they also were the most important, in terms of numbers, of the food organisms selected (Tables 3 and 4). This importance of the

Table 3. The total numbers (and percentages) of each food item consumed by Coleman Pond walleyes during each sample month, 1978.

Food item		Sample month						
		Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Total
Trichoptera				1(0.02)	3(0.63)			4(0.01)
Odonata			2(0.01)					2(-)
Coleoptera	Dytiscidae		56(0.37)	17(0.32)	2(0.42)	1(0.35)		76(0.27)
Hemiptera	Corixidae							
	Notonectidae							4(0.01)
Diptera	Unidentified	4(0.06)						
	Chaoborinae							289(1.0)
	Chironomidae	40(0.6)	201(1.3)	43(0.81)	4(0.84)	1(0.35)		1(-)
Plecoptera			1(-)					
Ephemeroptera								15609(56.1)
Cladocera		4957(73.8)	5845(39.1)	4486(84.9)	321(67.4)			10988(39.5)
Copepoda		1699(25.3)	8801(58.8)	485(9.2)	3(0.63)			615(2.2)
Amphipoda		4(0.06)	26(0.17)	216(4.1)	99(20.8)	238(82.6)	32(35.2)	
Hirudinae								47(0.17)
Fish		8(0.12)	7(0.05)	19(0.36)	10(2.1)	3(1.0)		
Insect remains			2(0.01)	2(0.04)			1(1.1)	5(0.02)
Plant matter		1(0.02)		1(0.02)	1(0.21)	1(0.35)		4(0.01)
Digested matter		2(0.03)	17(0.11)	12(0.23)	33(6.9)	44(15.3)	58(63.7)	166(0.6)
Total no. of food items		6715	14958	5282	476	288	91	27810
Empty stomachs		6	37	118	24	24	20	262
No. of stomachs		227	208	250	149	149	100	1085

Table 4. The total numbers (and percentages) of each food item consumed by Coleman Pond walleyes during each sample month, 1979.

Food item		Sample month					
		Jun.	Jul.	Aug.	Sept.	Oct.	Total
Trichoptera					8(3.5)		8(0.2)
Odonata				14(6.8)	8(3.5)	3(1.9)	25(0.6)
Coleoptera	Dytiscidae		1(-)				1(-)
Hemiptera	Corixidae		8(0.4)	9(4.4)	3(1.3)		20(0.5)
	Notonectidae						
Diptera	Unidentified						
	Chaoborinae						
	Chironomidae	146(14.0)	759(27.0)	82(40.0)	17(7.4)	14(9.0)	1018(23.2)
Plecoptera							
Ephemeroptera							
Cladocera		497(50.0)	32(1.2)		124(53.9)	34(21.8)	688(15.7)
Copepoda		355(36.0)	1964(70.0)	30(14.6)	10(4.3)	62(39.7)	2421(55.1)
Amphipoda			26(0.9)	51(22.2)	51(22.2)	32(20.5)	160(3.6)
Hirudenea							
Fish			1(-)	7(3.4)	5(2.2)	11(7.1)	24(0.5)
Insect remains				1(0.5)			1(-)
Plant matter							
Digested matter			11(0.5)	11(5.4)	4(1.7)		26(0.6)
Total no. of food items		998	2802	205	230	156	4392
Empty stomachs		0	22	52	62	59	159
No. of stomachs		100	100	100	100	100	500

copepods and cladocerans to the overall diet of the walleyes is questionable in view of their small size. Walleyes began selecting larger organisms later in the season. Furthermore, cladocerans formed 53.9% of the organisms consumed by walleyes in the September, 1979 samples (Table 4). Examination of Table 2 reveals that only one walleye had ingested all of these cladocerans. Totals for the entire sample period show that the highest numbers of food organisms consumed by walleyes were cladocerans in 1978 and copepods in 1979. Chironomids comprised 23.2% of the food organisms in 1979 (Table 4), but only one per cent in 1978 (Table 3).

When the seasonal summary is examined, chironomids, cladocerans, copepods and amphipods were the food items with the highest frequency of occurrences in walleye stomachs relative to all food types consumed in both years (Tables 5 and 6 and Figures 2 and 3).

The variety of food items ingested by Coleman Pond walleyes in 1978 and 1979 was similar to items eaten in the same pond in 1977. In June, 1977, copepods were an important "first" food, whereas cladocerans were initially eaten in 1978 and 1979. Chironomids were not eaten in significant numbers by Coleman Pond walleyes in 1977. In contrast, chironomid larvae appeared in some numbers by late June in 1978 and 1979 and remained a common food item through July. Hemipterans (corixids) were noted in 56% of stomachs
in walleye samples taken from Coleman Pond in July, 1977

Table 5. The number and percentage occurrence of an individual food item based on the sum of all occurrences found in each rearing pond, 1978.

Food item		Coleman		Freshwater		Kelly		Pacheta	
		no. of occurrences	%	no. of occurrences	%	no. of occurrences	%	no. of occurrences	%
Trichoptera				2	(0.16)	2	(0.16)	3	(0.27)
Odonata		4	(0.28)	19	(1.6)	7	(0.55)	20	(1.8)
Coleoptera	Dytiscidae	2	(0.14)	5	(0.41)	11	(0.87)	8	(0.71)
Hemiptera	Corixidae	31	(2.2)	23	(1.9)	11	(0.87)	51	(4.6)
	Notonectidae			7	(0.57)	2	(0.16)	3	(0.27)
Diptera	Unidentified	3	(0.21)	2	(0.16)	3	(0.24)		
	Chaoborinae					527	(41.6)	9	(0.80)
	Chironomidae	82	(5.7)	62	(5.1)	49	(3.9)	137	(12.7)
Plecoptera		1	(0.07)	6	(0.49)			1	(0.09)
Ephemeroptera				13	(1.1)			3	(0.27)
Cladocera		308	(21.4)	83	(6.8)	127	(10.0)	145	(12.9)
Copepoda		290	(20.1)	46	(3.8)	130	(10.3)	91	(8.1)
Amphipoda		247	(17.1)	187	(15.2)	147	(11.6)	90	(8.0)
Hirudinea				14	(1.1)	3	(0.24)	14	(1.3)
Fish		39	(2.7)	296	(24.1)			31	(2.8)
Insect remains		4	(0.28)	8	(0.65)	3	(0.24)	19	(1.7)
Plant matter		3	(0.21)	4	(0.33)			10	(0.89)
Digested matter		166	(11.5)	195	(15.9)	100	(7.9)	87	(7.8)
Empty stomachs		262	(18.2)	255	(20.8)	145	(11.4)	398	(35.5)
Total no. of occurrences		1442		1227		1267		1120	
No. of stomachs		1085		1074		943		935	

Table 6. The number and percentage occurrence of an individual food item based on the sum of all occurrences found in each rearing pond, 1979.

Food item	Coleman		Freshwater		Kelly		Pacheta	
	no. of occurrences	%	no. of occurrences	%	no. of occurrences	%	no. of occurrences	%
Trichoptera	6	(1.0)					1	(0.36)
Odonata	14	(2.4)	2	(0.63)	2	(0.58)	5	(1.8)
Coleoptera - Dytiscidae	1	(0.17)	10	(3.1)	1	(0.29)		
Hemiptera - Corixidae	15	(2.5)	14	(4.4)			8	(2.9)
Notonectidae								
Diptera - Unidentified								
Chaoborinae					108	(31.1)		
Chironomidae	82	(13.9)	25	(7.9)	18	(5.2)	12	(4.3)
Plecoptera								
Ephemeroptera								
Cladocera	78	(13.2)	82	(25.8)	30	(8.7)	61	(21.8)
Copepoda	79	(13.4)	19	(6.0)	50	(14.4)	16	(5.7)
Amphipoda	67	(11.4)	9	(2.8)	53	(15.3)	16	(5.7)
Hirudinea					7	(2.0)		
Fish	24	(4.1)	78	(24.5)	12	(3.5)	24	(8.6)
Insect remains	1	(0.17)	2	(0.63)			1	(0.36)
Plant matter					1	(0.29)	4	(1.4)
Digested matter	24	(4.1)	9	(2.8)	20	(5.8)	15	(5.4)
Empty stomachs	199	(33.7)	68	(21.4)	45	(13.0)	117	(41.8)
Total no. of occurrences	590		318		347		280	
No. of stomachs	500		250		250		250	

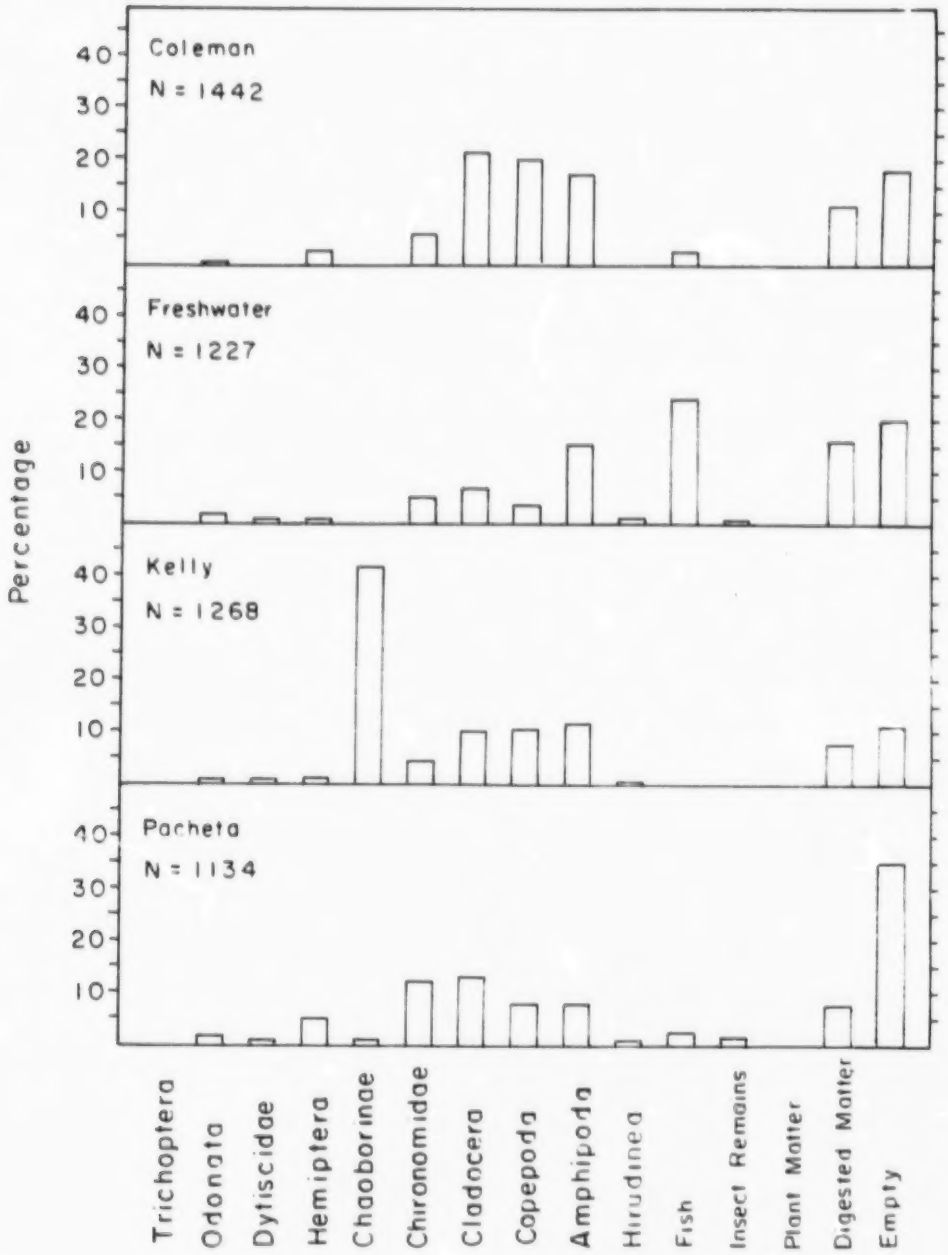

Fig. 2. The percentage occurrence of individual food items in relation to all food items eaten by walleyes in each Lake Winnipegosis rearing pond, 1978. N = total number of occurrences observed for all food items.

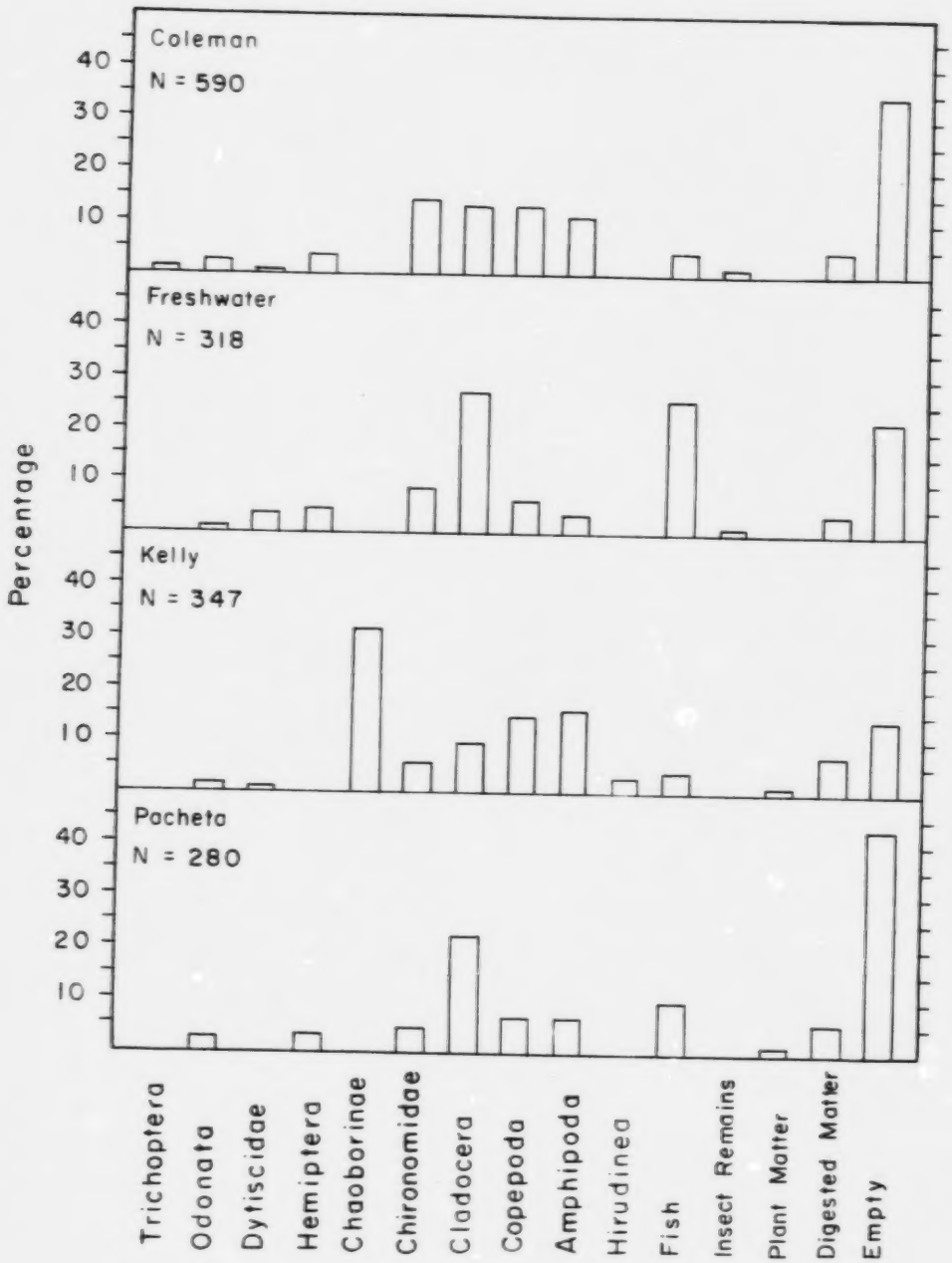

Fig. 3. The percentage occurrence of individual food items in relation to all food items eaten by walleyes in each Lake Winnipegosis rearing pond, 1979. N = total number of occurrences observed for all food items.

(Campbell and Rowes 1980) and in 21% of samples taken in July, 1978. In July, 1979, however, hemipterans formed only 6% of the diet of walleyes collected. Amphipods occurred in 94% of walleye stomachs in early August, 1977, and also formed a large part of the diet in August, 1978. The August, 1979 sample suggested walleyes preyed equally as heavy on amphipods, chironomids and fish. Amphipods formed the mainstay of the diet during September and October in 1978 and 1979, with fish occurring in 18% of the stomachs in the latter part of October, 1979. Sampling was not carried out past mid-August, 1977.

Freshwater Pond - Samples collected from Freshwater Pond in early June indicated that cladocerans and copepods were the two principal food items selected by most walleyes. Cladocerans were observed in 53.5% of the stomachs in 1978 (Table 7) and 96% in 1979 (Table 8). Copepods were found in 30% of the stomachs in 1978 and 22% in 1979.

During late June and early July, stomach samples showed walleyes selecting a greater variety of foods and larger food organisms. Dytiscids and hemipterans were first evident at this time. The proportion of forage fish in walleye stomachs was higher in late June (51%) than for all other periods sampled during 1978 (Table 7). From late June to September, 1978, walleyes

Table 7. The number (and percentage)of walleye stomachs containing a particular food item - Freshwater Pond, 1978.

Food item		Sampling Period											
		Jun.		Jul.		Aug.		Sept.		Oct.		Nov.	
		30-12	19-25	2-16	22-31	6-14	20-27	2-10	16	1-10	23-25	1-8	Total
Trichoptera						2(2.0)							2(0.19)
Odonata					1(0.96)	2(2.0)	2(2.0)	2(2.0)	6(12.0)	6(4.1)			19(1.8)
Coleoptera	Dytiscidae		4(4.1)		1(0.96)								5(0.47)
Hemiptera	Corixidae			5(3.3)	9(8.7)	3(3.0)	4(4.0)	1(0.99)		1(0.68)			23(2.1)
	Notonectidae			3(2.0)	1(0.96)	2(2.0)	1(1.0)						7(0.65)
Diptera	Unidentified				1(0.96)					1(0.68)			2(0.19)
	Chaoborinae												
	Chironomidae	16(16.2)	13(13.3)	17(11.0)	4(3.9)	6(6.0)	2(2.0)		1(2.0)	2(1.4)		1(1.0)	62(5.8)
Plecoptera											6(27.3)		6(0.56)
Ephemeroptera		1(1.0)		1(0.65)		1(1.0)				6(4.1)		4(4.0)	13(1.2)
Cladocera		53(53.5)	11(11.2)	10(6.5)	2(1.9)			4(4.0)				3(3.0)	83(7.7)
Copepoda		30(30.3)	12(12.2)	3(2.0)				1(0.99)					46(4.3)
Amphipoda				12(7.8)	8(7.7)	5(5.0)	17(17.2)	13(12.9)	16(32.0)	83(56.1)	8(36.4)	25(25.3)	187(17.4)
Hirudinea				3(2.0)	2(1.9)	1(1.0)	2(2.0)	1(0.99)	1(2.0)	4(2.7)			14(1.3)
Fish		8(8.1)	50(51.0)	57(37.0)	52(50.0)	42(42.0)	40(40.4)	15(14.9)	10(20.0)	8(5.4)	6(27.3)	8(8.1)	296(27.6)
Insect remains					2(1.9)	3(3.0)		2(2.0)		1(0.68)			8(0.74)
Plant matter							1(1.0)	2(2.0)	1(2.0)				4(0.37)
Digested matter		7(7.1)	9(9.2)	7(4.6)	15(14.4)	5(5.0)	17(17.2)	38(37.6)	15(30.0)	32(21.6)	6(27.3)	44(44.4)	195(18.2)
Empty stomachs		22(22.2)	8(8.2)	49(31.8)	26(25.0)	42(42.0)	28(28.3)	29(28.7)	11(22.0)	21(14.2)	2(9.1)	17(17.2)	255(23.7)
No. of stomachs		99	98	154	104	100	99	101	50	148	22	99	1074

Table 8. The number (and percentage) of walleye stomachs containing a particular food item - Freshwater Pond, 1979.

Food item		Sampling Period					
		Jun.		Jul.		Aug.	
		16	30	16	29-30	12-14	Total
Trichoptera							
Odonata				2(4.0)			2(0.8)
Coleoptera	Dytiscidae		10(20.0)				10(4.0)
Hemiptera	Corixidae		1(2.0)	3(6.0)	10(20.0)		14(5.6)
	Notonectidae						
Diptera	Unidentified						
	Chaoborinae						
	Chironomidae		13(26.0)		9(18.0)	3(6.0)	25(10.0)
Plecoptera							
Ephemeroptera							
Cladocera		48(96.0)	26(42.0)	5(10.0)	3(6.0)		82(32.8)
Copepoda		11(22.0)	5(10.0)	1(2.0)	2(4.0)		19(7.6)
Amphipoda		1(2.0)		1(2.0)	6(12.0)	1(2.0)	9(3.6)
Hirudinea							
Fish		1(2.0)	6(12.0)	45(90.0)	26(52.0)		78(31.2)
Insect remains				1(2.0)	1(2.0)		2(0.8)
Plant matter							
Digested matter			2(4.0)	1(2.0)	4(8.0)	2(4.0)	9(3.6)
Empty stomachs		2(4.0)	3(6.0)	4(8.0)	14(28.0)	45(90.0)	68(27.2)
No. of stomachs		50	50	50	50	50	250

usually selected forage fish (fathead minnows, *Promephales promelas*, and brook stickleback, *Culaea inconstans*). Fish were also important in the diet of Freshwater Pond walleyes in 1979; they were found in 90% and 52% of the July 16 and July 29-30 stomach samples, respectively (Table 8). After August 4, 1979, samples of walleyes could not be captured in Freshwater Pond due to heavy predation by pike. From mid-September to November, 1978, amphipods were found in the majority of walleye stomachs containing recognizable food (Table 7). Caddisflies (Trichoptera) and leeches (Hirudinea) were not observed in any walleye stomachs in 1979, but were in 1978. Leeches were found in stomach samples from early July to early October, 1978.

The number of empty stomachs observed in samples of Freshwater Pond walleyes seemed highest in July and August. Overnight trapnet sets were made from July onward. As indicated previously, the number of empty stomachs during this time period was undoubtedly a function of increased digestive rates resulting from the warmer temperatures. Digested matter was present in a greater proportion of the stomachs sampled from September to November when water temperatures were cooler.

When the total number of individual food items ingested was examined, copepods comprised the highest number (44%) eaten in June, 1978 (Table 9). Cladocerans ranked as the most important food in June, 1979 when they constituted 80.7% of the various items consumed (Table 10). The food items contributing most to the numbers eaten in both years were cladocerans, copepods,

Table 9. The total numbers (and percentages) of each food item consumed by Freshwater Pond walleyes during each sample month, 1978.

Food item		Sample Month						
		Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Total
Trichoptera				2(0.60)				2(0.07)
Odonata			1(0.11)	7(2.1)	13(6.0)	5(1.0)		26(0.87)
Coleoptera	Dytiscidae	4(0.45)	1(0.11)					5(0.17)
Hemiptera	Corixidae		65(7.1)	10(3.0)	3(1.4)	3(0.63)		82(2.7)
	Notonectidae		13(1.4)	52(15.6)				65(2.2)
Diptera	Unidentified Chaoborinae		2(0.22)		1(0.21)			3(0.10)
	Chironomidae	62(6.9)	230(25.1)	61(18.3)	1(0.46)	2(0.42)	1(0.67)	358(12.0)
Plecoptera						40(8.4)		40(1.3)
Ephemeroptera		1(0.11)	2(0.22)	1(0.30)		6(1.3)	5(3.3)	15(0.50)
Cladocera		348(38.8)	360(39.3)		25(11.6)		51(34.0)	784(26.2)
Copepoda		396(44.1)	33(3.6)	71(21.3)	1(0.46)			501(16.8)
Amphipoda			42(4.6)		78(36.1)	349(73.2)	41(27.3)	510(17.1)
Hirudinea			11(11.2)	3(0.90)	5(2.3)	8(1.7)		27(0.90)
Fish		69(7.7)	131(14.3)	100(30.0)	31(14.4)	25(5.2)	8(5.3)	364(12.2)
Insect remains			2(0.22)	3(0.90)	2(0.93)	1(0.21)		8(0.27)
Plant matter		1(0.11)		1(0.30)	3(1.4)			5(0.17)
Digested matter		16(1.8)	22(2.4)	22(6.6)	53(24.5)	38(8.0)	44(29.3)	195(6.5)
Total no. food items		897	915	333	216	477	150	2989
Empty stomachs		30	75	70	40	23	17	255
No. of stomachs		197	258	199	151	170	99	1074

Table 10. The total numbers (and percentages) of each food item consumed by Freshwater Pond walleyes during each sample month, 1979.

Food item		Sample Month			
		Jun.	Jul.	Aug.	Total
Trichoptera					
Odonata			2(0.3)		2(0.1)
Coleoptera	Dytiscidae	11(1.6)			11(0.8)
Hemiptera	Corixidae	1(0.1)	28(4.0)		29(2.0)
	Notonectidae				
Diptera	Unidentified				
	Chaoborinae				
	Chironomidae	42(6.0)	246(35.3)	49(90.7)	337(23.2)
Plecoptera					
Ephemeroptera					
Cladocera		568(80.7)	217(31.2)		785(54.0)
Copepoda		71(10.1)	37(5.3)		108(7.5)
Amphipoda		1(0.1)	8(1.1)	3(5.6)	12(0.8)
Hirudinea					
Fish		8(1.1)	151(21.7)		159(10.9)
Insect remains			2(0.3)		2(0.1)
Plant matter					
Digested matter		2(0.3)	5(0.7)	2(3.7)	9(0.6)
Total no. of food items		704	696	54	1454
Empty stomachs		5	18	45	68
No. of stomachs		100	100	50	250

chironomids, amphipods and fish. High numbers of fish were consumed during July of both years. Fish constituted 14.3% of the total monthly diet in July, 1978 and 21.7% in July, 1979 (Table 9 and 10).

Considering the entire sampling period, the most important food items, in terms of numerical importance, in Freshwater Pond walleyes were fish and amphipods in 1978 (Table 5, Fig. 2) and cladocerans and fish in 1979 (Table 6, Fig. 3).

Sampling done in Freshwater Pond between 1977 and 1979 indicated cladocerans were eaten in substantial numbers through early June. By the end of June in 1977 and 1978, chironomids were an important food. Fathead minnows and brook sticklebacks appeared in the diet in June in all three years and were the most common item eaten throughout the 1978 and 1979 sampling seasons. Fish were quite abundant in the Freshwater Pond walleye diet during the later part of July, 1977. Amphipods had become increasingly important from mid-July, 1977 and 1978 to the final sampling date in both years. Amphipods were found in only 3% of the walleye stomachs in 1979.

Kelly Pond - Copepods were the most common food item selected by walleyes in Kelly Pond during early June. Copepods were found in 82.8% and 100% of the walleye stomachs examined in June, 1978 and 1979, respectively (Tables 11 and 12).

Table 11. The number (and percentage) of walleye stomachs containing a particular food item - Kelly Pond, 1978.

Food item	Sampling Period									
	Jun.		Jul.		Aug.		Sept.		Oct.	
	31-14	22-28	4-12	18-25	3-7	16-22	5-12	19-25	18-25	Total
Trichoptera			2(1.8)							2(0.21)
Odonata			1(0.92)	2(1.8)	2(2.0)		1(1.0)		1(1.3)	7(0.74)
Coleoptera Dytiscidae		5(4.9)	2(1.8)	4(3.6)						11(1.2)
Hemiptera Corixidae		3(2.9)		4(3.6)	2(2.0)	1(0.98)		1(1.0)		11(1.2)
Notonectidae						1(0.98)		1(1.0)		2(0.21)
Diptera Unidentified				2(1.8)		1(0.98)				3(0.32)
Chaoborinae	53(36.5)	101(99.0)	109(100)	60(54.6)	62(62.0)	6(5.9)	24(24.0)	42(42.9)	15(19.5)	527(55.9)
Chironomidae	1(0.69)	9(8.8)	7(6.4)	9(8.2)	20(20.0)	3(2.9)				49(5.2)
Plecoptera										
Ephemeroptera										
Cladocera	44(30.3)	16(15.7)	15(13.8)	12(10.9)	16(16.0)	2(2.0)	13(13.0)	10(10.2)	8(10.4)	127(13.5)
Copepoda	120(82.8)	9(8.8)	1(0.92)							130(13.8)
Amphipoda			19(17.4)	24(21.8)	35(35.0)	13(12.8)	31(31.0)	22(22.5)	5(6.5)	147(15.6)
Hirudinea			1(0.92)		1(1.0)		1(1.0)			3(0.32)
Fish										
Insect remains					1(1.0)	1(0.98)			1(1.3)	3(0.32)
Plant matter										
Digested matter				7(6.4)	3(3.0)	7(6.9)	27(27.0)	32(32.7)	24(31.2)	100(10.6)
Empty stomachs	5(3.5)	1(0.98)		27(24.6)	21(21.0)	28(27.5)	24(24.0)	10(10.2)	29(37.7)	145(15.4)
No. of stomachs	145	102	109	110	100	102	100	98	77	943

Table 12. The number (and percentage) of walleye stomachs containing a particular food item - Kelly Pond, 1979.

Food item		Sampling Period Jun. 14	Jul. 11	Aug. 8	Sept. 5-6	Oct. 2	Total
Trichoptera					2(4.0)		2(0.8)
Odonata							
Coleoptera	Dytiscidae		1(2.0)				1(0.4)
Hemiptera	Corixidae						
	Notonectidae						
Diptera	Unidentified						
	Chaoborinae	1(2.0)	48(96.0)	32(64.0)	12(24.0)	15(30.0)	108(43.2)
	Chironomidae		7(14.0)	11(22.0)			18(7.2)
Plecoptera							
Ephemeroptera							
Cladocera		22(44.0)	6(12.0)	2(4.0)			30(12.0)
Copepoda		50(100)					50(20.0)
Amphipoda			2(4.0)	35(72.0)	8(16.0)	8(16.0)	53(21.2)
Hirudinea				4(8.0)	3(6.0)		7(2.8)
Fish		1(2.0)		10(20.0)	1(2.0)		12(4.8)
Insect remains							
Plant matter				1(2.0)			1(0.4)
Digested matter					19(38.0)	1(2.0)	20(8.0)
Empty stomachs			3(6.0)	2(4.0)	11(22.0)	29(58.0)	45(18.0)
No. of stomachs		50	50	50	50	50	250

Cladocerans were also again important and were found in 30.3% and 44 % of the walleyes sampled in 1978 and 1979, respectively. From the end of June,1978 and mid-July, 1979, *Chaoborus* was the principal food item selected by Kelly Pond walleyes. During July of both years, *Chaoborus* was found in 96% to 100% of the walleye stomachs.

September, 1978, and August, 1979, were the only times after June when a food organism other than *Chaoborus* was observed in a higher percentage of the walleyes. Amphipods were eaten by 31% and 70% of the walleyes examined in September, 1978 and August, 1979. In August, 1978 and 1979, chironomids were also an important food item; they were noted in 20 to 22% of the walleyes sampled. Fish weren't observed in walleye stomachs in 1978, but did occur in as many as 20% of the stomachs examined in August, 1979 (Table 12).

As noted in Coleman and Freshwater ponds, a higher proportion of empty stomachs occurred in July and later. This can again be attributed to the length of the trapnet sets.

The numerical summary of individual food items eaten indicated that copepods were the major type of organisms consumed during June. They formed 88.2% and 58.6% of the numbers of food organisms eaten in 1978 and 1979, respectively (Table 13 and 14). The dominance of *Chaoborus* from July to October is indicated by the numbers of Kelly Pond walleyes which selected this food type (Tables 11 and 12) and by the number consumed during this period of time. *Chaoborus* formed 78.2% and 82.8% of the total number of all food types eaten (Tables 13 and 14).

Table 13. The total number (and percentages) of each food item consumed by Kelly Pond walleyes during each sample month, 1978.

Food item		Sample Month					
		Jun.	Jul.	Aug.	Sept.	Oct.	Total
Trichoptera			2(0.03)				2(0.01)
Odonata			3(0.04)	2(0.04)	1(0.03)	1(0.26)	7(0.04)
Coleoptera	Dytiscidae	6(0.28)	7(0.10)				13(0.08)
Hemiptera	Corixidae	4(0.19)	5(0.07)	3(0.06)	1(0.03)		13(0.08)
	Notonectidae			1(0.02)	1(0.03)		2(0.01)
Diptera	Unidentified		8(0.11)	1(0.02)			9(0.05)
	Chaoborinae	599(28.1)	6609(91.9)	4367(93.0)	1915(64.3)	99(26.1)	13589(78.2)
	Chironomidae	21(0.98)	22(0.31)	33(0.70)			76(0.44)
Plecoptera							
Ephemeroptera							
Cladocera		254(11.9)	448(6.2)	197(4.2)	861(28.9)	249(65.5)	2009(11.6)
Copepoda		1249(58.6)	1(0.01)				1250(7.2)
Amphipoda			77(1.1)	77(1.6)	137(4.6)	6(1.6)	297(1.7)
Hirudinea			1(0.01)	1(0.01)	1(0.03)		3(0.02)
Fish							
Insect remains				2(0.04)		1(0.26)	3(0.02)
Plant matter							
Digested matter			7(0.10)	10(0.21)	59(2.0)	24(6.3)	100(0.58)
Total no. of food items		2133	7190	4694	2976	380	17373
Empty stomachs		5	27	49	34	29	144
No. of stomachs		247	219	202	198	77	943

Table 14. The total numbers (and percentages) of each food item consumed by Kelly Pond walleyes during each sample month, 1979.

Food item		Sample Month					
		Jun.	Jul.	Aug.	Sept.	Oct.	Total
Trichoptera							
Odonata					3(1.0)		3(0.06)
Coleoptera	Dytiscidae		1(0.1)				1(0.02)
Hemiptera	Corixidae						
	Notonectidae						
Diptera	Unidentified						
	Chaoborinae	1(0.2)	1276(89.6)	1743(90.6)	233(74.4)	694(97.2)	3947(82.3)
	Chironomidae		42(2.9)	18(0.9)			60(1.2)
Plecoptera							
Ephemeroptera							
Cladocera		48(11.4)	103(7.2)	2(0.1)			153(3.2)
Copepoda		372(88.2)					372(7.7)
Amphipoda			3(0.2)	143(7.4)	54(17.2)	19(2.7)	219(4.6)
Hirudinea				6(0.3)	3(1.0)		9(0.2)
Fish		1(0.2)		11(0.6)	1(0.3)		13(0.3)
Insect remains							
Plant matter				1(0.1)			1(0.02)
Digested matter					19(6.1)	1(0.1)	20(0.4)
Total no. of food items		422	1425	1924	313	714	4798
Empty stomachs			2	2	11	29	44
No. of stomachs		50	50	50	50	50	250

The total diet of walleyes throughout the sampling periods in 1978 and 1979 revealed that *Chaoborus* comprised 41.6% and 31% of the food items, respectively (Tables 5 and 6, Figs. 2 and 3). Cladocerans, copepods and amphipods formed 10% or more of the food organisms consumed by Kelly Pond walleyes.

Pacheta Pond - Examination of Pacheta Pond walleye stomachs in June indicated a prevalence of cladocerans, copepods and chironomids. Cladocerans were observed most frequently; they appeared in 83.6% and 98% of the stomachs examined in June, 1978 and June, 1979 respectively (Tables 15 and 16).

A larger variety of food items appeared in the stomachs of Pacheta Pond walleyes during July. Cladocerans were still selected by a high percentage of walleyes in July, 1979. In July, 1978, only 2% of the walleyes selected cladocerans. Chironomids were selected by most walleyes (15.7%) in July, 1978 (Table 15). From August to the end of sampling in 1978, amphipods were observed in the greatest number of walleye stomachs which contained recognizable food. In 1979, forage fish was the main food item selected by Pacheta Pond walleyes from August to October (Table 16). *Chaoborus* larvae were also noticed in Pacheta Pond walleye stomachs during June and early July, 1978. This was the only time *Chaoborus* was observed in walleye samples from other than Kelly Pond.

Table 15. The number (and percentage) of walleye stomachs containing a particular food item - Pacheta Pond, 1978.

Food item		Sampling Period									
		Jun.		Jul.		Aug.		Sept.		Oct.	Total
		2-10	16-30	6-14	20-27	4-10	19-24	1-7	14	20-27	
Trichoptera			1(0.63)				1(0.9)	1(1.0)			3(0.32)
Odonata						6(5.8)	13(11.5)		1(2.0)		20(2.1)
Coleoptera	Dytiscidae		3(1.9)	4(3.9)	2(2.0)						8(0.86)
Hemiptera	Corixidae		4(2.5)	13(12.8)	13(12.8)	3(2.9)	11(9.7)	7(7.0)			51(5.5)
	Notonectidae			1(0.98)	1(0.98)			1(1.0)			3(0.32)
Diptera	Unidentified										
	Chaoborinae	7(6.4)	3(1.9)	1(0.98)							10(1.1)
	Chironomidae	36(32.7)	2(1.3)	16(15.7)	8(7.8)	2(1.9)	3(2.7)				137(14.7)
Plecoptera										1(1.1)	1(0.11)
Ephemeroptera				2(2.0)				1(1.0)			3(0.32)
Cladocera		92(83.6)	49(30.6)	2(2.0)		1(0.97)				1(1.1)	145(15.5)
Copepoda		43(39.1)	36(22.5)	10(9.8)		1(0.97)	2(1.7)				91(9.7)
Amphipoda		1(0.91)		8(7.8)	10(9.8)	6(5.8)	15(13.3)	41(41.0)	8(16.0)	1(1.1)	90(9.6)
Hirudinea				2(2.0)	4(3.9)	2(1.9)	3(2.7)	1(1.0)	2(4.0)		14(1.5)
Fish		1(0.91)		3(2.9)	5(4.9)	3(2.9)	1(0.9)	11(11.0)	3(6.0)	4(4.2)	31(3.3)
Insect remains			4(2.5)	1(0.98)	5(4.9)	1(0.97)	8(7.1)				19(2.0)
Plant matter							4(3.5)	5(5.0)		2(2.1)	10(1.1)
Digested matter		1(0.91)	2(1.3)	2(2.0)	3(2.9)	7(6.8)	9(8.0)	13(13.0)	4(8.0)	46(48.4)	87(9.3)
Empty stomachs			49(30.6)	58(56.9)	58(56.9)	75(72.8)	56(49.6)	26(26.0)	33(66.0)	43(45.3)	398(42.6)
No. of stomachs		110	160	102	102	103	113	100	50	95	935

Table 16. The number (and percentage) of walleye stomachs containing a particular food item - Pacheta Pond, 1979.

Food item		Sampling Period Jun. 13	Jul. 11	Aug. 9	Sept. 5-6	Oct. 4-6	Total
Trichoptera						1(2.0)	1(0.4)
Odonata					3(6.0)	2(4.0)	5(2.0)
Coleoptera	Dytiscidae						
Hemiptera	Corixidae		5(10.0)	1(2.0)	2(4.0)		8(3.2)
	Notonectidae						
Diptera	Unidentified						
	Chaoborinae						
	Chironomidae	3(6.0)	7(14.0)	2(4.0)			12(4.8)
Plecoptera							
Ephemeroptera							
Cladocera		49(98.0)	10(20.0)	2(4.0)			61(24.4)
Copepoda		8(16.0)	8(16.0)				16(6.4)
Amphipoda			3(6.0)	1(2.0)	4(8.0)	8(16.0)	16(6.4)
Hirudinea							
Fish			2(4.0)	4(8.0)	7(14.0)	11(22.0)	24(9.6)
Insect remains				1(2.0)			1(0.4)
Plant matter				2(4.0)	1(2.0)	1(2.0)	4(1.6)
Digested matter			1(2.0)	8(16.0)	2(4.0)	4(8.0)	15(6.0)
Empty stomachs			30(60.0)	32(64.0)	32(64.0)	23(46.0)	117(46.8)
No. of stomachs		50	50	50	50	50	250

It is significant to note that a high percentage of walleye stomachs examined in July in both years were empty even though the length of the trap set was usually 4 hr. Throughout the remainder of the sample period a high number of empty stomachs was recorded in each year (Table 15 and 16). This was because, as in other ponds, overnight sets were required to capture adequate samples.

Representative percentages based on the number of items eaten indicated cladocerans were consumed in highest numbers during July of 1978 and 1979 (Tables 17 and 18). During September and October larger food types such as forage fish, amphipods and Odonata nymphs comprised the majority of numbers consumed. In September, 1978, 68.2% of the number of all food organisms eaten were amphipods (Table 17), while Odonata nymphs comprised 47% of the food organisms consumed in September, 1979 (Table 18).

Of all food items, cladocerans, copepods and amphipods occurred most frequently in the diet of Pacheta Pond walleyes both in 1978 and 1979. The second most common food item occurring in the Pacheta Pond walleye diet was chironomids in 1978 and forage fish in 1979. Chironomids were observed in 12.2% of walleye stomachs in 1978 (Fig. 5, Table 2) and forage fish were noted in 9% of walleyes sampled in 1979 (Fig. 6, Table 3).

Table 17. The total numbers (and percentages) of each food item consumed by Pacheta Pond walleyes during each sample month, 1978.

Food item		Sample Month					
		Jun.	Jul.	Aug.	Sept.	Oct.	Total
Trichoptera		1(0.04)		1(0.44)	1(0.55)		3(0.07)
Odonata				21(9.4)	1(0.55)		22(0.55)
Coleoptera	Dytiscidae	3(0.10)	6(0.90)				9(0.22)
Hemiptera	Corixidae	6(0.21)	48(7.2)	15(6.7)	7(3.9)		76(1.9)
	Notonectidae		2(0.30)		1(0.55)		3(0.07)
Diptera	Unidentified Chaoborinae	19(0.66)	27(4.0)				46(1.2)
	Chironomidae	390(13.5)	121(18.1)	9(4.0)			520(12.9)
Plecoptera						1(1.8)	1(0.03)
Ephemeroptera			2(0.30)		1(0.55)		3(0.07)
Cladocera		1717(59.5)	25(3.7)	53(23.7)		1(1.8)	1796(44.7)
Copepoda		741(25.7)	393(58.7)	56(25.0)			1190(29.6)
Amphipoda		1(0.04)	19(2.8)	30(13.4)	131(72.0)	1(1.8)	182(4.5)
Hirudinea			8(1.2)	5(2.2)	3(1.7)		16(0.40)
Fish		1(0.04)	8(1.2)	5(2.2)	15(8.2)	4(7.3)	33(0.82)
Insect remains		4(0.14)	6(0.90)	9(4.0)			19(0.47)
Plant matter				4(1.8)	5(2.8)	2(3.6)	11(0.27)
Digested matter		3(0.10)	5(0.75)	16(7.1)	17(9.3)	46(83.6)	87(2.2)
Total no. of food items		2886	670	224	182	55	4017
Empty stomachs		49	116	131	59	43	398
No. of stomachs		270	204	216	150	95	935

Table 18. The total numbers (and percentages) of each food item consumed by Pacheta Pond walleyes during each sample month, 1979.

Food Item		Sample Month					Total
		Jun.	Jul.	Aug.	Sept.	Oct.	
Trichoptera						2(7.1)	2(0.2)
Odonata					14(47.0)	2(7.1)	16(1.6)
Coleoptera	Dytiscidae		6(0.9)	1(4.2)	2(7.0)		9(0.9)
Hemiptera	Corixidae						
	Notonectidae						
Diptera	Unidentified						
	Chaoborinae						
	Chironomidae	3(1.1)	12(1.9)	4(16.6)			19(1.9)
Plecoptera							
Ephemeroptera							
Cladocera		254(95.9)	526(82.2)	2(8.3)			782(79.6)
Copepoda		8(3.0)	90(14.0)				98(10.0)
Amphipoda			3(0.5)	1(4.2)	4(13.4)	9(32.1)	17(1.8)
Hirudinea							
Fish			2(0.3)		7(23.4)	10(35.7)	19(1.9)
Insect remains				1(4.2)			1(0.1)
Plant matter				2(8.3)	1(2.2)	1(3.5)	4(0.4)
Digested matter			1(0.2	9(37.5)	2(7.0)	4(14.3)	16(1.6)
Total no. of food items		265	640	20	30	28	983
Empty stomachs			30	32	32	23	117
No. of stomachs		50	50	50	50	50	250

The feeding habits of Pacheta Pond walleyes in 1978 and 1979 indicated that cladocerans formed the bulk of the diet in the early part of the growing season. Fish and amphipods were commonly ingested during the balance of the season.

Growth

Lengths and weights were obtained from walleye samples at regular intervals in each summer season. Age was represented as the number of days following hatching. For example, in 1978, day one for Coleman Pond walleyes was taken as May 24, since the majority of fry released into the pond had hatched on this date.

Growth of walleyes in Lake Winnipegosis rearing ponds varied between ponds and from year to year. At approximately 60 days of age, walleyes from the rearing ponds ranged from an average fork length of 59 mm (Pacheta Pond) in 1978 to 76 mm (Coleman Pond) in 1979 (Tables 19 and 20). Freshwater Pond walleyes had the best average growth in 1978, while Kelly Pond walleyes showed the best average growth in 1979 (Fig. 4). Walleyes in Freshwater Pond averaged 104 mm (range 79-143) at 102 days of age in 1978. The average lengths of walleyes from the other rearing ponds varied between 74-94 mm for approximately the same age (Table 19). In 1979, Kelly Pond walleyes attained an average length of 116 mm (range 94-143) after 100 days, while walleyes from the other ponds were only an average of 76-91 mm (Table 20). Slowest growth for both years was found in Pacheta

Table 19. The mean fork lengths (mm) and weights (g) of walleyes in Lake Winnipegosis rearing ponds, 1978.

Coleman				Freshwater				Kelly				Pacheta			
Date	Age (days)	F.L.	Wt.	Date	Age (days)	F.L.	Wt.	Date	Age (days)	F.L.	Wt.	Date	Age (days)	F.L.	Wt.
June 7	15	22.4	0.10	May 30	13	15.9	0.04	May 31	17	15.3	0.03	June 2	19	18.6	0.06
" 20	28	32.2	0.45	June 19	33	34.9	0.41	June 14	31	26.1	0.18	" 16	33	31.1	0.34
July 9	47	56.4	1.73	July 2	46	50.2	1.44	" 28	45	47.1	1.03	" 30	47	46.3	0.96
" 23	61	61.8	3.15	" 17	61	72.4	4.27	" 12	59	67.9	4.82	July 14	61	58.7	1.82
Aug. 7	76	75.0	4.36	" 31	75	87.6	7.26	" 25	72	79.8	4.85	" 29	74	69.5	2.99
" 22	91	81.0	5.31	Aug. 14	89	96.2	9.39	Aug. 8	86	89.2	8.25	Aug. 9	87	71.3	3.48
Sept.3	103	82.9	6.06	" 27	102	104.3	12.96	" 22	100	94.4	7.83	" 24	102	73.6	3.49
" 23	123	81.3	5.96	Sept. 16	122	113.2	14.42	Sept. 12	121	97.9	8.65	Sept.1	123	79.2	4.73
Oct. 1	131	86.4	6.11	Oct. 1	137	115.0	15.18	" 25	134	103.7	10.33	" 14	-	-	-
" 23	153	93.6	8.48	" 10	146	113.4	14.23	Oct.19	156	101.1	9.84	Oct.20	159	81.0	5.14
Nov. 8	169	90.6	9.23	Nov. 1	168	107.5	12.79	" 25	164	102.2	10.10	" 27	166	75.4	4.38

Table 20. The mean fork lengths (mm) and weights (g) of walleyes in Lake Winnipegosis rearing ponds, 1979.

Coleman				Freshwater				Kelly*				Pacheta*			
Date	Age (days)	F.L.	Wt.	Date	Age (days)	F.L.	Wt.	Date	Age (days)	F.L.	Wt.	Date	Age (days)	F.L.	Wt.
June 15	15	17.2	0.05	June 16	16	15.6	0.04	June 14	16	14.2	0.02	June 13	15	13.4	0.02
" 29	29	36.5	0.52	" 30	30	35.3	0.45	-	-	-	-	-	-	-	-
July 14	44	58.2	2.00	July 16	46	56.2	1.80	July 11	43	63.6	2.82	July 11	43	47.5	1.01
" 28	58	75.6	4.15	" 30	60	66.7	2.87	-	-	-	-	-	-	-	-
Aug. 11	72	83.9	5.55	Aug. 14	75	77.3	4.27	Aug. 8	71	104.7	11.84	Aug. 9	72	66.3	2.53
" 25	86	87.2	6.10	-	-	-	-	-	-	-	-	-	-	-	-
Sept. 9	101	91.1	7.50					Sept. 6	100	115.8	14.99	Sept. 6	100	76.1	4.34
" 22	114	92.8	7.04	-	-	-	-	-	-	-	-	-	-	-	-
Oct. 8	130	92.8	7.45					Oct. 2	126	118.0	15.01	Oct. 6	130	75.1	4.03
" 22	144	97.5	9.06	-	-	-	-	-	-	-	-	-	-	-	-

* Samples collected every four weeks.

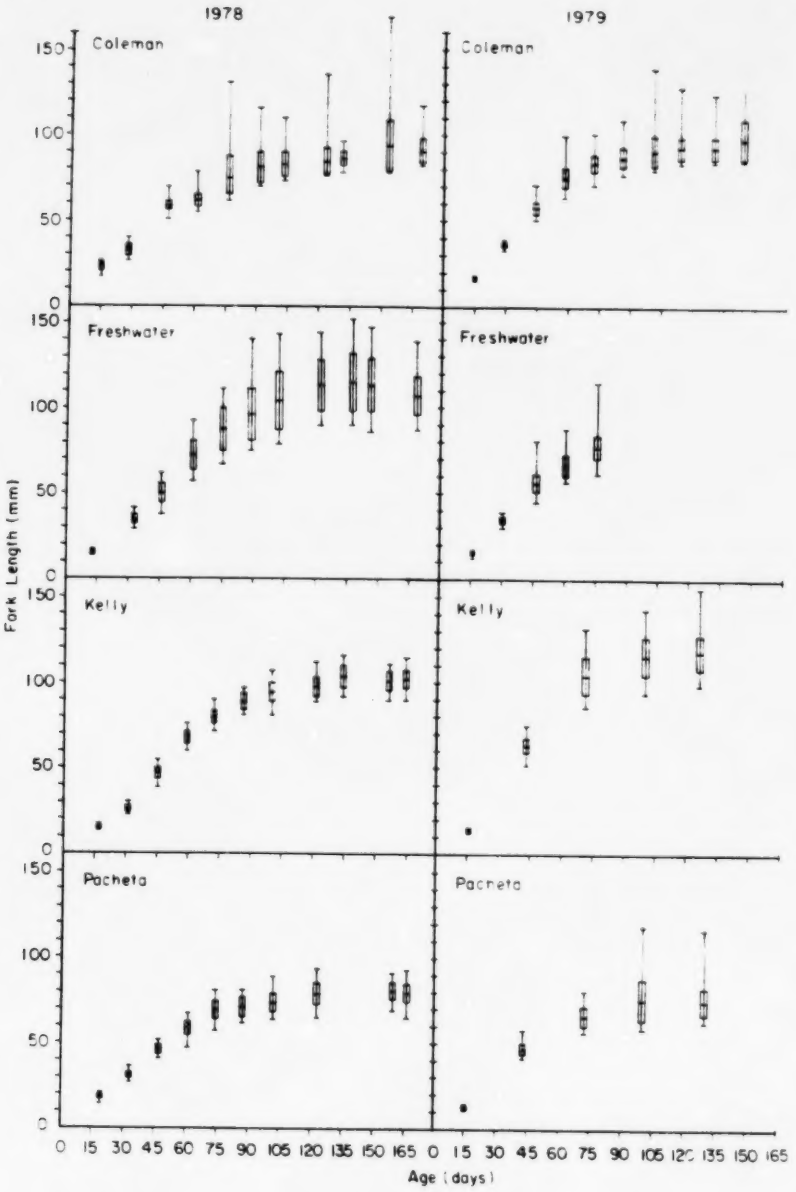

Fig. 4. Mean fork lengths (with range and standard deviation) of walleyes from four Lake Winnipegosis rearing ponds during each sampling period, 1978 and 1979.

Pond. At 159 days, Pacheta Pond walleyes average 81 mm in 1978. Walleyes from the other rearing ponds had reached at least this size after 91 days in 1978. In 1979, Pacheta Pond walleyes averaged 75 mm (63-117 mm) after 130 days, while those from Coleman and Kelly ponds were an average of 93 mm and 118 mm, respectively (Table 20).

Rearing ponds with the lower stocking densities generally had better walleye growth. In 1978, Freshwater Pond had the lowest stocking rate (2324 fry/ha) and these walleyes exhibited the fastest growth. Pacheta Pond had the highest stocking rate and the poorest walleye growth (Fig. 5). Coleman and Kelly ponds also showed similar results in 1978. The same trend occurred in 1979, except in the case of Kelly Pond. Kelly Pond had a higher stocking rate than either Coleman or Freshwater ponds, yet it exhibited the best growth. It should be noted, however, that Kelly Pond was stocked with fry whose numbers were estimated by purely visual observation. Coleman and Freshwater ponds, on the other hand, were stocked with fry hatched from eggs whose numbers were determined by volumetric displacement measurements. The stocking rate for Kelly Pond could have been considerably less than stated due to errors resulting from visual estimation of fry numbers.

In addition to exhibiting the best average growth in 1979, Kelly Pond walleyes also showed the greatest divergence in average size between 1978 and 1979. Samples of 2-week old

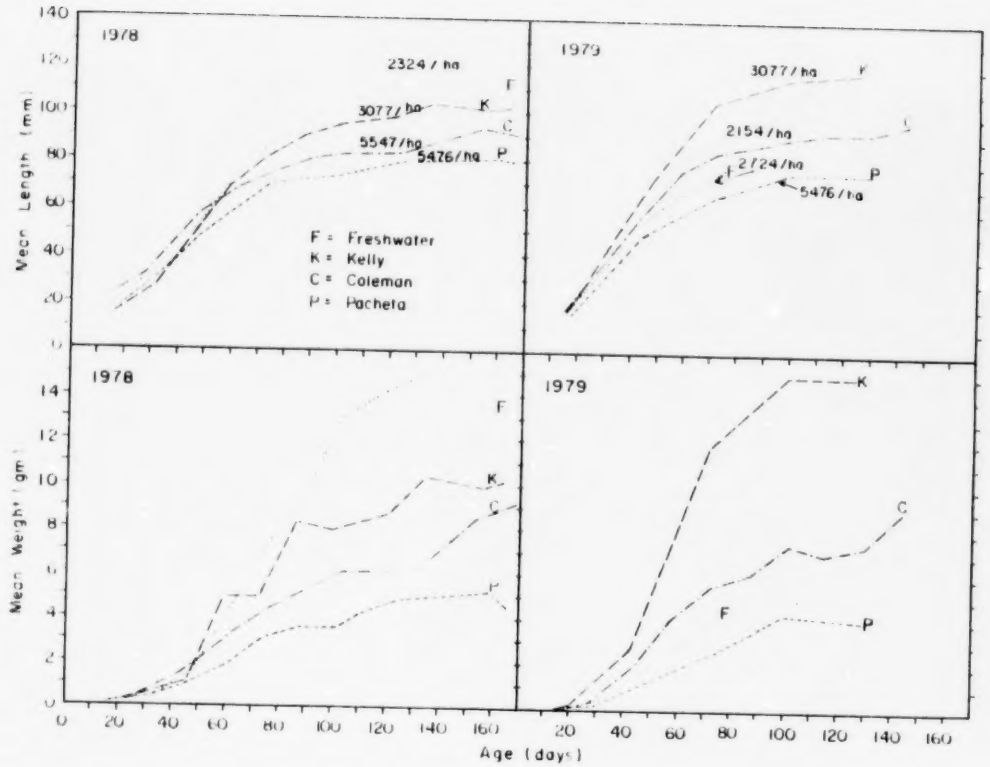

Fig. 5. Mean fork length and weight growth curves (with associated stocking rates of fry numbers/ha) for walleyes in four Lake Winnipegosis rearing ponds, 1978 and 1979. Stocking rates for Coleman and Freshwater ponds were based on volumetric estimates of egg numbers.

walleyes in 1978 and 1979 had similar average lengths of 15 and 14 mm, respectively. However, walleyes 45 days and older grew considerably faster in 1979 than in 1978. Within 43 days after hatching , walleyes had attained a mean length of 64 mm in 1979 as compared to the 47 mm length of 45 day old fry in 1978. Throughout the remainder of the 1979 summer season walleyes achieved better growth than those in 1978 (Tables 19 and 20).

Coleman Pond walleyes appeared to exhibit similar growth in 1978 and 1979 (Fig. 4). However, from 29 days of age, walleyes in 1979 were consistently larger in average size than walleyes in 1978 at comparative ages. These length differences were never very large and usually under 1.0 cm. Mean weights of Coleman Pond walleyes in 1979 at 58, 101 and 130 days of ages were 1.00, 1.44 and 1.34 g, respectively, more than the mean weights of 61, 103, and 131 day-old walleyes in 1978 (Tables 19 and 20).

Walleyes from Pacheta Pond also indicated similar growth between years (Fig. 4). Average lengths at comparative ages varied about 4-5 mm between years (Tables 19 and 20). The largest difference in average weights was 0.85 g between 100 day-old walleyes in 1978 and 102 day-old walleyes in 1979.

Samples obtained from Freshwater Pond indicated that walleye growth was greater in 1979 for 30 and 46 day-old fry, but was less than the 1978 growth for 60 and 75 day-old fry

(Tables 19 and 20). In 1979, walleye samples could not be obtained from Freshwater Pond due to the presence of pike; comparison of growth between 1978 and 1979 was therefore limited.

Size differences between individual walleyes from all rearing ponds were small up to about 30 days of age. Beyond an age of 40-45 days, some individuals reached sizes considerably larger than average (Fig. 4). The maximum size of these faster growing walleyes usually extended well beyond the average.

Although walleye growth varied between rearing ponds, all walleyes demonstrated similar patterns of growth. Growth was rapid from the time of hatching to mid or late July, when the walleyes were approximately 60-75 days of age, and then began to taper off in August (Fig. 4). Only in Freshwater Pond did the fast growth rate seem to continue after late July. Growth there appeared to slow down when walleyes were between 100 and 120 days old.

Further indications of early rapid growth are provided by the length increments (or net gains in length) between sampling periods (Tables 21 and 22). Each net gain in length was expressed as a percentage of the entire summer's increment. Bi-weekly length increments from 15-75 days of age were commonly 10% or more of the total summer increment. Beyond 75 days, walleye lengths usually increased by less than 10% between bi-weekly sampling periods. Exceptions to this were observed in Kelly

Table 21. Length increments for walleyes in Lake Winnipegosis rearing ponds between sampling periods, 1978.

Coleman			Freshwater			Kelly			Pacheta		
Sample period*	Increment (mm)	%	Sample period*	Increment (mm)	%	Sample period*	Increment (mm)	%	Sample period*	Increment (mm)	%
15-28	9.8	14.4	13-33	19.0	20.8	17-31	10.8	12.4	19-33	12.6	20.7
29-47	24.1	35.4	34-46	15.3	16.7	32-45	20.9	24.1	34-47	15.2	24.9
48-61	10.8	15.8	47-61	22.2	24.3	46-59	20.8	24.0	48-61	12.4	20.3
62-76	7.8	11.4	62-75	15.2	16.6	60-72	11.9	13.7	62-74	10.8	17.7
77-91	6.0	8.8	76-89	8.6	9.4	73-86	9.4	10.8	75-87	1.9	3.1
92-103	1.9	2.8	90-102	8.1	8.9	87-100	5.2	6.0	88-102	2.3	3.8
104-123	0.07	1.0	103-122	8.9	9.7	101-121	3.5	4.0	103-110	2.5	4.1
124-131	3.5	5.1	123-137	1.8	2.0	122-134	5.9	6.8	111-123	3.0	4.9
132-153	7.2	10.6	138-146	-1.6	-1.7	134-156	-2.7	-3.1	124-159	1.9	3.1
154-169	-3.0	-4.4	147-168	-6.0	-6.6	156-164	1.1	1.3	160-166	-1.6	-2.6

* Days following hatching.

Table 22. Length increments for walleyes in Lake Winnipegosis rearing ponds between sampling periods, 1979.

Coleman			Freshwater			Kelly[1]			Pacheta[1]		
Sample period*	Increment (mm)	%	Sample period*	Increment (mm)	%	Sample period*	Increment (mm)	%	Sample period*	Increment (mm)	%
15-29	19.3	24.0	16-30	19.7	31.9	16-43	49.4	47.5	15-43	34.2	55.4
30-44	21.8	27.1	31-46	20.9	33.9						
45-58	17.4	21.6	47-60	10.6	17.2	44-71	41.2	39.7	44-72	18.7	30.3
59-72	8.3	10.3	61-75	10.5	17.0						
73-86	3.4	4.2									
87-101	3.9	4.8				72-100	11.1	10.7	73-100	9.8	15.9
102-114	1.7	2.1									
115-130	0.02	0.02				101-126	2.2	2.1	101-130	-1.0	-1.6
131-144	4.6	5.7									

* Days following hatching

[1] Sample periods contained double the number of days than those from Coleman and Freshwater.

and Pacheta ponds in 1979, where 70-100 day-old walleyes showed increased of 11% and 15%, respectively. However, Kelly and Pacheta ponds were sampled every four weeks in 1979, doubling the amount of growing days between sampling periods as compared to the 1978 samples.

To determine if growth rates varied significantly between rearing ponds or between years, an analysis of covariance ($P \geq 0.05$) was conducted using the slopes for the growth curves for length (Table 23). No significant differences were found when the growth curves were all compared at the same time. However, when the best growth curve in 1978 (Freshwater Pond) was compared to the poorest growth curve in 1978 (Pacheta Pond), there was a significant difference in the elevation. No significant difference was found between the fastest and slowest growth rates in 1979. No significant differences were found in comparisons of the 1978 and 1979 growth of walleyes in each rearing pond.

DISCUSSION

Cladocerans were common in the early diet of the Lake Winnipegosis rearing pond walleyes and were eaten in large amounts especially in Freshwater and Pacheta ponds. Copepods were commonly chosen by Coleman and Kelly pond walleyes, with cladocerans being the second most important food item which was initially selected.

Table 23. Covariance analysis of Lake Winnipegosis rearing pond walleye growth data. Age and length data transformed to natural logs.

Comparison	Slopes F value and d.f.	Elevation F value and d.f.
1978 length growth curves for walleyes from all rearing ponds	3.2525(3,35)	3.8370(3, 38)
1979 length growth curves for walleyes from all rearing ponds	1.9338(3,17)	2.2179(3, 20)
1978 and 1979 Coleman Pond walleye mean lengths	1.5077(1,16)	1.7233(1, 17)
1978 and 1979 Freshwater Pond walleye mean lengths	0.5001(1, 6)	0.5861(1, 7)
1978 and 1979 Kelly Pond walleye mean lengths	1.5149(1,12)	4.5867(1, 13)
1978 and 1979 Pacheta Pond walleye mean lengths	1.4421(1,11)	0.0196(1, 12)
Best average walleye growth in 1978 (Freshwater Pond) and poorest average walleye growth in 1978 (Pacheta Pond)	2.2104(1,17)	12.5567(1, 18)*
Best average walleye growth in 1979 (Kelly Pond and poorest average walleye growth in 1979 (Pacheta Pond)	1.1771(1, 6)	4.2960(1, 7)

* significant difference $P \geq 0.05$

Other studies on the diet of rearing pond walleyes have indicated that cladocerans or copepods formed the bulk of the walleye's early diet (Walker and Applegate 1976, Dobie 1969, Cheshire and Steele 1963, and Smith and Moyle 1945). Studies of underyearling walleyes in natural waters have also indicated some initial preference for cladocerans and copepods (eg. Bulkley et al. 1976, Priegal 1970, Houde 1967, Dobie 1966, Hohn 1966, Ridenhour 1960, and Smith and Pycha 1960).

Amphipods were eaten by walleye fry in all Lake Winnipegosis rearing ponds. Their importance in the diet of the young walleyes varied throughout the season. Chironomids were chosen when available in all ponds. Smith and Moyle (1945) found that cladocerans, chironomids and *Chaoborus* were eaten by rearing pond walleyes in Minnesota throughout the summer season. Schneider (1975) and Parsons (1971) indicated the importance of availability of food organisms in the feeding habits of underyearling walleyes. This also applied to the Lake Winnipegosis rearing pond walleyes which ate whatever was of suitable size, abundant and readily available. Coleman Pond walleyes had relied heavily on chironomids. *Chaoborus* was the single most important food item chosen by Kelly Pond walleyes. *Chaoborus* was very abundant in both the substrate and water column of

Kelly Pond. The species did not occur in significant numbers in any of the other rearing ponds. Seasonal abundance of larval and pupal stages of aquatic insects such as chironomids in the diet were evident in late June and through July and August. Fish were eaten in all ponds, but their level of occurrence in the diet appeared to be dependant upon their availability. Forage fish are not common in the Lake Winnipegosis rearing ponds because of winterkill conditions. During 1977-1979, brook sticklebacks *(Culaea inconstans)* and fathead minnows *(Pimephales promelas)* were readily available to Freshwater Pond walleyes and were heavily utilized throughout the growing season. In other studies it was noted that when forage fish such as trout-perch *(Percopsis omiscomaycus)* and freshwater drum *(Aplodinotus grunniens)* became scarce, walleyes under natural conditions ate chironomids and *Leptodora* which were abundant (Priegal 1970). Walker and Applegate (1976) indicated aquatic insects (chironomids corixids, Ephemeroptera and Odonata) formed the bulk of the diet of rearing pond walleyes after forage fish populations declined.

The remains of larval fish, believed to be cyprinids, were found in Freshwater and Kelly pond walleye stomachs in mid-June, 1979. The mean fork length of the walleyes at this time was 15 mm. Fish appeared in the July diet of Pacheta and Coleman pond walleyes when they had attained a mean fork length

of 50 mm. Dobie (1975) and Smith and Moyle (1945) indicated Minnesota rearing pond walleyes began eating fish between 15-19 mm, total length (TL). Smith and Moyle (1945) found that walleyes relied heavily on fish for forage at 60-80 mm, providing the forage was abundant. Walker and Applegate (1976) observed South Dakota rearing pond walleyes eating fish (fathead minnows) at 62 mm TL and eating fish exclusively at 106 mm TL. Priegal (1970) found naturally produced walleyes in Wisconsin feeding on fish at 35 mm TL. Other studies by Wolfert (1966), Smith and Pycha (1960), Ridenhour (1960) and Rawson (1957) found that underyearling walleyes depended very heavily on forage fishes after the walleyes had reached a TL of 50 mm. Yellow perch *(Perca flavescens)* was an important forage fish of walleyes in natural lakes in Michigan (Eschmeyer 1950), New York (Houde 1967) and Minnesota (Dobie 1966). The senior author, in an unpublished study of underyearling walleyes in the Grand Rapids area of Lake Winnipeg from 1974 to 1976, found that over 50% of the walleyes' diet consisted of fish. In 1975, 30% of the walleye stomachs contained young-of-the-year yellow perch. Fathead minnows may also be an important forage fish for young walleyes. Maloney (1953) observed that the diet of underyearling walleyes in Minnesota rearing ponds consisted of 71.5% fathead minnows. Fathead minnows were also found to enhance the growth and survival of walleyes in Michigan rearing ponds (Schneider 1975).

Various reasons have been attributed to differences in walleye growth between rearing ponds and between years. For example, Smith and Moyle (1945) found that growth varied greatly according to the fertility of rearing ponds, available forage and the management methods employed. Forney (1966) observed that walleye growth was slower when the diet was more diverse. Walker and Applegate (1976) found that growth was greatest when forage fish occurred frequently in walleye stomachs. In 1978, walleyes in Freshwater Pond had consumed a large number of forage fish and these walleyes exhibited the best growth compared to the other rearing ponds. Kelly Pond walleyes, which fed mainly on *Chaoborus*, demonstrated the second best growth rate in 1978 and the best in 1979. Very few empty stomachs were found in samples of Kelly Pond walleyes during most of the growing season. Empty stomachs were only observed in September and October in Kelly Pond. The results for Freshwater Pond and Kelly Pond suggest that the type of food may not be the most important determinant of walleye growth. Growth may be influenced as much by the availability of a preferred food as by the type of food. This has been observed in other studies; Dobie (1969) noted that walleye growth in Minnesota rearing ponds may be just as rapid on plankton and insects as on fish.

Space may have been a key factor determining the extent of walleye growth in some Lake Winnipegosis rearing ponds. Dobie (1969) found that a difference in food habits between rearing ponds didn't influence walleye growth as much as did space. In 1978, Lake Winnipegosis rearing ponds stocked with the

least amount of fry per hectare usually produced the best growth. Coleman Pond in 1978 was stocked with twice the number of fry stocked in 1979, and walleye growth was marginally better in 1979. Coleman and Pacheta ponds were stocked at similar rates in 1978, but walleye growth was much better in Coleman Pond. The poorer growth in Pacheta Pond might be attributable to its physical characteristics. Pacheta Pond has a surface area similar to that of Coleman and Freshwater ponds. Depths over most of Pacheta Pond have been extremely shallow causing a much reduced volume of water compared to Coleman or Freshwater ponds. Walleyes in Pacheta Pond appeared to frequent the dredged release channel throughout the summer rather than the balance of the pond which was much shallower and lacked vegetative cover. Traps set in this channel invariably yielded large catches of walleyes during the summer. With decreased water volume, walleyes in the channel became overcrowded and stressed. The wide variety of food items found in the stomachs of Pacheta Pond walleyes indicated they were feeding on organisms that were available in the channel cut. Since a large number of walleyes was occupying the channel area, the available food was, in all likelihood, insufficient to support the population. This was evident by the large numbers of empty stomachs noted in samples collected after only a 4 hr set. Empty stomachs were never observed in samples taken in such a short time from any of the other rearing ponds. Pacheta Pond

was also the only pond sampled in 1979 that had some walleyes stomachs containing plant matter. This further substantiates the conclusion that walleyes in Pacheta Pond were overcrowded and that preferred food organisms were scarce.

Water levels in the Lake Winnipegosis rearing ponds varied from 1978 to 1979. This would determine the amount of space available to walleyes in all rearing ponds. Water levels were much higher in 1979. The additional water volume or space could account for the better growth of Kelly Pond walleyes in 1979, despite the presumed similar stocking rates in 1978 and 1979.

Average growth of walleyes in the rearing ponds was not found to be as good as that of natural stocks in Lake Winnipegosis. A sample of 102 underyearlings walleyes taken from Lake Winnipegosis in the vicinity of the rearing ponds on August 23, 1979 had a mean length of 123 mm (90 - 138 mm). The best mean length of walleyes from any of the rearing ponds in early September was 116 mm. By the end of September, 1979, however, some individual walleyes had attained a fork length of up to 150 mm in Kelly Pond, and 130 mm in Coleman Pond. This indicates some reared walleyes were growing almost as well as those in Lake Winnipegosis. Mean lengths of Lake Winnipegosis walleyes were 146 to 160 mm in early to mid-September. These lengths may not be entirely representative of walleye growth in the lake since they are based on small samples which consisted

of culls from the commercial fishery.

The growth of walleyes in the Lake Winnipegosis rearing ponds was comparable to or better than the growth of underyearling walleyes from Lac La Ronge, Saskatchewan and Lake Winnipeg. Rawson (1957) reported underyearling walleyes in Lac La Ronge attained a fork length of 104 mm by the end of September. Underyearling walleye samples from northern Lake Winnipeg at the beginning of September in 1974 and 1975 had average fork lengths of 76 mm and 83 mm, respectively (Derksen and Gillies, unpublished data). Underyearling walleyes from lower latitude lakes in the US, however, achieve greater size than walleyes in the Lake Winnipegosis rearing ponds. Lake Winnipegosis rearing pond walleyes had mean fork lengths of 90-120 mm by the end of summer, whereas walleyes attained mean lengths of 129 mm in Red Lakes, Minnesota (Smith and Pycha 1960), 127-185 mm in Lake Winnebago, Wisconsin (Priegal 1970) and 123 to 158 mm in four mainstream Missouri River reservoirs (Nelson and Walberg 1976). Latitudinal differences, however, do not appear to cause any changes in growth rate over time. Dobie (1969) observed that walleyes reared in some Minnesota rearing ponds reached average lengths of 58 mm in 60 days. A similar size was achieved by walleyes in Lake Winnipegosis rearing ponds in the same period of time.

SUMMARY

In 1978 and 1979, walleye fry were stocked in four rearing ponds located in close proximity to Lake Winnipegosis. Walleye samples were collected from these ponds at regular intervals to document their feeding habits and growth.

Walleyes in Coleman, Freshwater, Kelly and Pacheta ponds were opportunistic feeders and ate what was seasonally available and abundant. Cladocerans and copepods were important first food types chosen by larval walleye within 14 days of age. At the end of June (30-40 days of age) walleyes had begun selecting a greater variety of organisms. Larger food types such as amphipods and forage fish were usually chosen near the end of June when the walleyes had attained 35 mm or more of fork length. However, forage fish were noticed in the odd walleye having only 14-20 mm TL. Coleman Pond walleyes relied heavily on chironomid larvae and amphipods for the remainder of the season. Freshwater Pond walleyes utilized forage fish heavily in 1978 and 1979. Fish (brook sticklebacks and fathead minnows) were eaten in all ponds, but were not available to the same degree in each pond. Overwinter survival of forage fishes appeared to vary from pond to pond. *Chaoborus* larvae were almost exclusively eaten in Kelly Pond with the exception of Pacheta Pond. Only 10 walleyes had chosen *Chaoborus* larvae in Pacheta Pond from June to mid-July, 1978.

The four food types most commonly selected by walleyes from all rearing ponds were chironomids, cladocerans, copepods and amphipods. Forage fish were chosen by walleyes from all four ponds more in 1979 than 1978, perhaps suggesting forage fish were more prevelent in the rearing ponds in 1979.

Walleye growth varied between rearing ponds and from year to year. At approximately 60 days of age, walleyes from the rearing ponds ranged from an average fork length of 59 mm (Pacheta Pond) in 1978 to 76 mm (Coleman Pond) in 1979. Rearing ponds with the lower stocking densities generally had better walleye growth. Pacheta Pond had the highest stocking rate and poorest walleye growth in both years. In 1978, Freshwater Pond had the lowest stocking rate and the best average walleye growth. However, Kelly Pond had a higher stocking rate than either Coleman or Freshwater ponds in 1979 and walleyes from Kelly Pond exhibited the best growth.

Walleye growth was rapid from hatching to mid or late July (60-75 days of age) and then tapered off in August (100-120 days of age). Early rapid growth was also indicated by length increments between sampling periods. Bi-weekly length increments from 15-75 days of age were commonly 10% or more of the total summer increment. Beyond 75 days increments were less than 10% of the total summer's growth, except in Kelly and Pacheta ponds in 1979. From these two ponds 70-100 day old walleyes showed

increases of 11% and 15%, respectively. However, Kelly and Pacheta ponds were sampled every four weeks in 1979 compared to every two weeks in 1978. This doubled the number of days between samples in 1979 allowing for greater growth increments.

Although differences in growth were apparent, an analysis of covariance ($P \geq 0.05$) conducted on the slopes of the age-length regressions indicated no significant differences between the 1978 and 1979 growth of walleyes in each pond. Comparisons between ponds in the same year indicated a significant difference in elevations when the best growth in 1978 (Freshwater Pond) was compared to the worst growth (Pacheta Pond). No difference was found between the rearing pond which had the fastest walleye growth and that with the slowest in 1979.

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